



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

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denr.sd.gov

**RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 8145-3, Dan Fanger**

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Program, Department of Environment and Natural Resources concerning Water Permit Application No. 8145-3, Dan Fanger, PO Box 123, Blunt SD 57522.

The Chief Engineer is recommending APPROVAL of Application No. 8145-3 because 1) there is reasonable probability that there is unappropriated water available for the applicant's proposed use, 2) the proposed diversion can be developed without unlawful impairment of existing rights, 3) the proposed use is a beneficial use and 4) it is in the public interest with the following qualifications:

1. The well approved under Water Permit No. 8145-3 will be located near domestic wells and other wells which may obtain water from the same aquifer. The well owner under this Permit shall control his withdrawals so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights.
2. This Permit is approved subject to the irrigation water use questionnaire being submitted each year.

See report on application for additional information.

Jeanne Goodman, Chief Engineer
May 20, 2015

1REPORT TO THE CHIEF ENGINEER
ON
WATER PERMIT APPLICATION NO. 8145-3
DAN FANGER
MAY 20, 2015

Water Permit Application No. 8145-3 proposes to divert water at a maximum diversion rate of 3.31 cubic feet per second (cfs) from one existing well, approximately 47 feet deep, completed into the Highmore Blunt aquifer. The well was originally authorized by Cancelled Permit No. 1503-3. The well is located in the approximate center of the NE $\frac{1}{4}$ Section 30 for the irrigation of 232 acres located in the S $\frac{1}{2}$ Section 20 and the NW $\frac{1}{4}$ NW $\frac{1}{4}$ Section 29; all in T113N-R75W in Sully County.

AQUIFER: Highmore Blunt (HB)

Aquifer Characteristics:

The Highmore Blunt aquifer is primarily composed of glacial sand and gravel and alluvium (Hamilton, 1986b). Hedges and others (1982) estimated the aquifer to underlie approximately 73,400 acres and contains an estimated 154,830 acre-feet (ac-ft) of recoverable water in storage in Hand, Hughes, Hyde and Sully Counties. The aquifer is generally under unconfined conditions, but can be confined locally. In Hughes County, the average thickness of the aquifer is 20 feet but can range from 2 to 45 feet (Hamilton, 1986a). Figure 1 shows a map of the aquifer with the location of the observation wells and the well this application proposes to use.

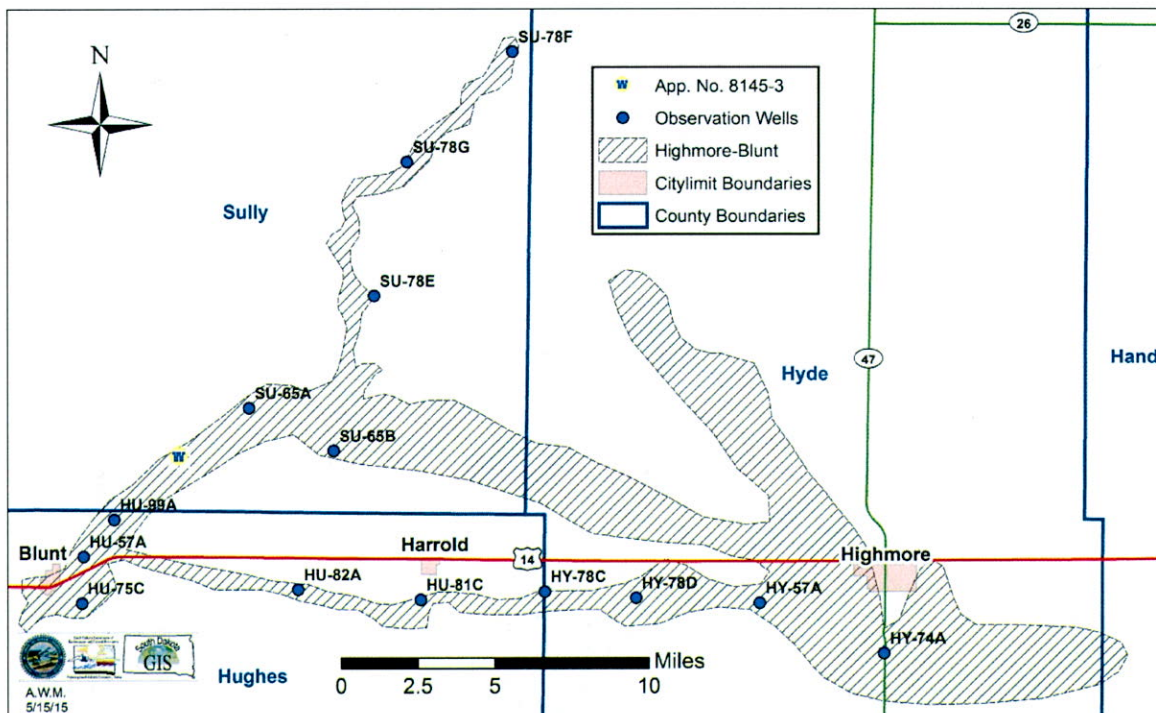


Figure 1- Map of Highmore Blunt aquifer (Hedges et. al, 1982) with DENR-Water Rights observation wells (Water Rights, 2015a)

The examination of works document in the file for Cancelled Permit No. 1503-3 states the well is 47 feet deep, and other documentation indicates the static water level was eight feet below grade in 1968.

South Dakota Codified Law (SDCL) 46-2A-9

Pursuant to SDCL 46-2A-9, a permit to appropriate water may be issued only if there is a reasonable probability that there is unappropriated water available for this applicant's proposed use, that the proposed diversion can be developed without unlawful impairment of existing rights and that the proposed use is a beneficial use and in the public interest. This report will address the availability of unappropriated water and effects on existing rights from the aquifer that are pertinent to this application.

WATER AVAILABILITY:

This application proposes to appropriate water from the Highmore Blunt aquifer. The probability of unappropriated water available from the aquifer can be evaluated by considering SDCL 46-6-3.1, which requires "No application to appropriate groundwater may be approved if, according to the best information reasonably available, it is probable that the quantity of water withdrawn annually from a groundwater source will exceed the quantity of the average estimated annual recharge of water to the groundwater source." If the source of the water is older or lower than the Greenhorn Formation and a public water system has applied for a permit, the Board need not consider the recharge/withdrawal issue. In this case, the aquifer is not stratigraphically lower than the Greenhorn Formation and the applicant is not a public water system.

In applying SDCL 46-6-3.1, the Sixth Judicial Circuit Court ruled in 2005 that if the Water Management Board uses average annual recharge, then it should also use average annual withdrawals to determine if unappropriated water is available from the aquifer (*Hines v. South Dakota Dept. of Environ. and Nat'l Resources, Hughes County 04-37*) (Memorandum Decision, April 29, 2005).

A 2012 First Judicial Circuit Court's rulings ultimately stated that data must be present to show it is probable the average annual recharge exceeds the average annual discharge by at least the amount requested by the water permit application being considered (*Hanson County Dairy v. Robert Bender and Stace Nelson*) (Memorandum Decision, April 11, 2012).

Later in 2012, the First Judicial Circuit Court stated that in deciding whether or not it is probable that the quantity of water withdrawn will exceed the quantity of the average estimated annual recharge is to be based according to the best information reasonably available, and that nothing in South Dakota law requires a recharge study (*Longview Farms, LLP v. South Dakota Dept. of Environ. and Nat'l Resources*) (Memorandum Decision, May 17, 2012).

Observation Well Data:

Administrative Rule of South Dakota Section 74:02:05:07 requires that the Water Management Board shall rely upon the record of observation well measurements and other data to determine that the quantity of water withdrawn annually from the aquifer does not exceed the estimated average annual recharge of the aquifer in addition to other data.

The DENR-Water Rights Program monitors 14 observation wells completed into the Highmore Blunt aquifer (Water Rights, 2015a). The nearest observation wells to the well site are SU-65A and HU-99A, which are 2.8 miles northeast and 2.9 miles southwest of the well site, respectively. The hydrographs for the observation wells SU-65A and HU-99A are shown in Figures 2 and 3, respectively. Observation wells SU-65A and HU-99A are representative of the aquifer. The hydrographs for the observation wells completed into the Highmore Blunt aquifer show increasing or stable water levels over the period of record.

The water levels in the observation wells show good response to climatic conditions. The hydrographs show that during wet years recharge exceeds discharge, and discharge exceeds recharge in dry years. The climatic effects on water levels greatly mask the temporal impacts of well withdrawals. Therefore, recharge to and natural discharge from the Highmore Blunt aquifer can be captured for pumping, and the hydrographs document that unappropriated water is available for this proposed appropriation.

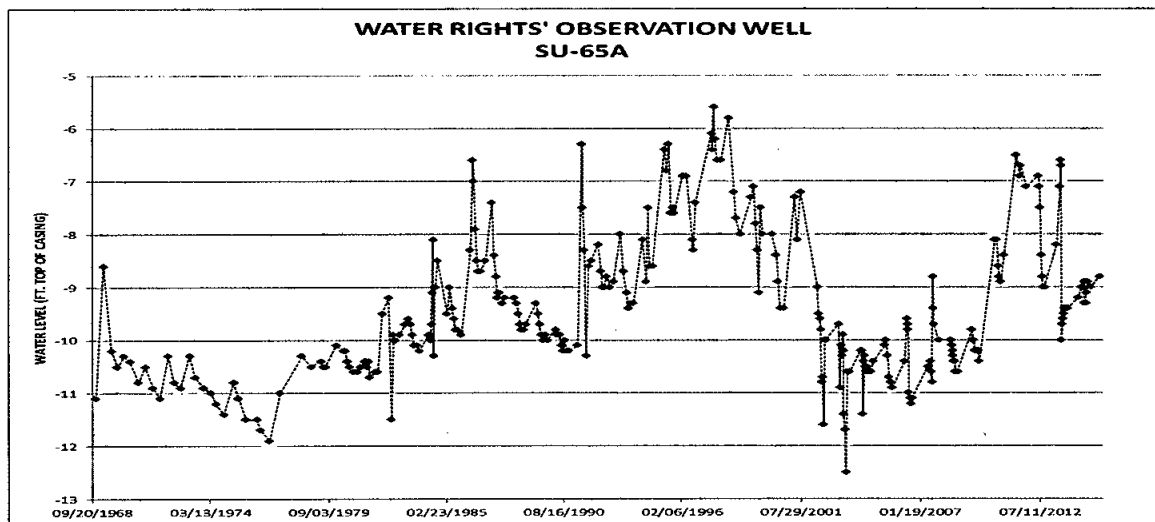


Figure 2- Hydrograph for observation well SU-65A (Water Rights, 2015a)

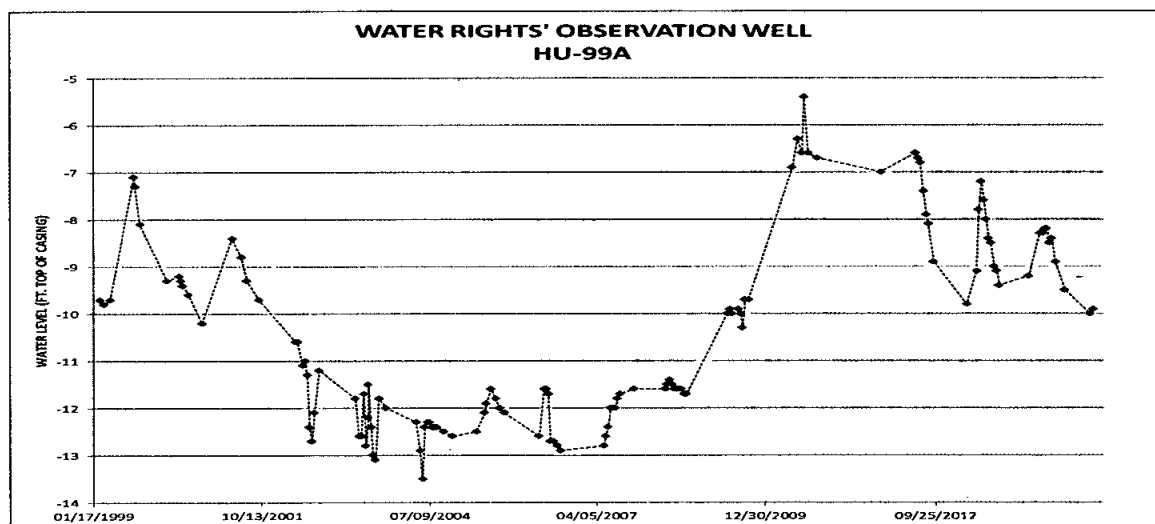


Figure 3- Hydrograph for observation well HU-99A (Water Rights, 2015a)

Recharge and Discharge:

Recharge:

Recharge to the aquifer is generally from precipitation and subsequent infiltration where the aquifer is at or near land surface. Hamilton (1986b) estimated a recharge rate of 0.4 in/yr. Hamilton's (1986b) method for calculating recharge is based on discharge calculations for 1981 assuming no change in storage. Hedges and others (1985) calculated and estimated a range of recharge rates to unconfined and non-buried aquifers, such as the Highmore Blunt aquifer, and estimated where in the range the Highmore Blunt aquifer would fall. Hedges and others (1985) had a recharge rate range of 2 to 5.6 in/yr, and the Highmore Blunt aquifer was estimated to be on the low end of that range. Hedges and others (1985) calculating methodology used the change in water levels in observation wells completed into similar types of aquifers. Therefore, it is likely that recharge to the Highmore Blunt aquifer ranges from 0.4 to 2 in/yr. Estimated average annual recharge rate to the Highmore Blunt aquifer ranges from 2,447 to 12,233 ac-ft/yr. However, it should be noted that both Hamilton's (1986b) and Hedges and others (1985) methodologies do not directly calculate the recharge to the Highmore Blunt aquifer and are therefore estimates.

Discharge:

Discharge from the Highmore Blunt aquifer occurs to streams, such as Medicine Knoll Creek, through evapotranspiration, and well withdrawals. There are 21 water rights/permits authorized to withdraw water from the Highmore Blunt aquifer (Water Rights, 2015b). There are also a number of domestic wells on file with the SD-DENR Water Rights Program that appear to be completed into the Highmore Blunt aquifer (Water Rights, 2015c). However, many of those may now be served by rural water systems, and withdrawal by domestic users is insignificant when compared to appropriative users.

The expected amount of water withdrawn from the aquifer by non-irrigation appropriations is estimated by assuming pumping at the maximum permitted diversion rate for 60 percent of the time. Expected annual water pumpage by non-irrigation appropriations from the Highmore Blunt aquifer is 189.8 ac-ft/yr (see Table 1). The City of Highmore, the City of Blunt, and the Town of Harrold are all connected to Mid-Dakota Rural Water; they only use their respective water rights for backup/standby use (Friedeman, 2015).

Permit No.	Name	County	Status	Use	CFS	Ac-ft
744-3*	City of Highmore	HY	LC	MUN	1.66	
1130-3*	City of Blunt	HU	LC	MUN	0.13	
2455-3*	Town of Harrold	HU	LC	MUN	0.16	
2828-3*	City of Blunt	HU	LC	MUN	0.44	
4512-3	Pete Lien & Sons Inc.	SU	LC	IND	0.26	112.9
6852-3	Todd Cowan	HY	PE	COM/LCO	0.044	19.1
7215-3	Morris Inc.	SU	PE	IND	0.133	57.8
					Total	189.8
* = Connected to Mid-Dakota Rural Water, only used as backup/standby system						

Table 1- Non-irrigation water rights/permits authorized to withdraw water from the Highmore Blunt aquifer (Water Rights, 2015b)

The average annual withdrawal from the Highmore Blunt aquifer by irrigation appropriations is 694.1 ac-ft/yr. The historic number of permits reporting, annual appropriation, and annual pumpage are shown in Table 2.

Year	Number of Permits Reporting	Appropriation (ac-ft)	Pumpage (ac-ft)
1979	25	16680	989
1980	25	16680	900
1981	25	16680	872
1982	19	11146.5	478.91
1983	20	12214.5	1094.38
1984	24	17965.5	760
1985	17	12600.9	877
1986	18	13110.9	1481
1987	17	11289.9	1083
1988	16	10689.9	1460.5
1989	14	5649.9	738
1990	14	5649.9	1002
1991	13	5515.6	876
1992	11	4345.6	694
1993	11	3556.6	464
1994	11	3916.6	913.64
1995	11	3916.6	811.81
1996	11	3916.6	900.2
1997	11	3916.6	304
1998	11	3916.6	947.04
1999	11	3916.6	496.28
2000	9	2731.6	326.14
2001	9	2731.6	298.3
2002	9	2731.6	620.75
2003	7	2262.1	543.56
2004	8	2382.1	623.99
2005	8	2382.1	464.9
2006	8	2382.1	439.93
2007	8	2382.1	403.04
2008	10	3442.1	404.94
2009	10	3442.1	468.88
2010	10	3442.1	291.67
2011	10	3442.1	209.91
2012	12	4572.1	498.61
2013	12	4272.1	556.81
Min	7	2262.1	209.91
Max	25	17965.5	1481
Avg.	13.3	6567.8	694.1

Table 2- Historic irrigation water use from the Highmore Blunt aquifer (Water Rights, 1980-2014)

Hydrologic Budget:

Estimated average annual withdrawal from the Highmore Blunt aquifer is 883.9 ac-ft/yr. The range for estimated annual recharge to the aquifer is 2,447 to 12,233 ac-ft/yr. Therefore, there is a reasonable probability that unappropriated water is available for this proposed appropriation.

EXISTING WATER RIGHTS:

There are no water rights/permits authorizing diversions from the Highmore Blunt aquifer within approximately 2.3 miles of the well site (Water Rights, 2015b). It is likely there are several domestic wells within 2.3 miles of the well site.

Most of the observation wells completed into the Highmore Blunt aquifer are within one mile of several wells authorized by water rights/permits. However, none of the hydrographs for the observation wells show pumping to cause a significant adverse impact on adequate wells. The Water Management Board defined an “adversely impacted domestic well” in ARSD 74:02:04:20(7) as:

“a well in which the pump intake was set at least 20 feet below the top of the aquifer at the time of construction or, if the aquifer is less than 20 feet thick, is as near to the bottom of the aquifer as is practical and the water level of the aquifer has declined to a level that the pump will no longer deliver sufficient water for the well owner’s needs”

In the past, the Water Management Board has recognized that to place water to maximum beneficial use, a certain amount of drawdown may occur. Since the aquifer is under unconfined conditions drawdown due to pumping would not be significant far from the well site. Therefore, nearby adequate wells are not expected to be adversely or unlawfully impaired by the proposed diversion.

The Highmore Blunt aquifer is a relatively thin aquifer in some areas. While the average annual withdrawal would not exceed average annual recharge to the aquifer, conditions may occur when the withdrawal exceeds recharge. When this occurs, water will be removed from storage, consequently reducing the saturated thickness of the aquifer. If the saturated thickness is reduced to the extent that water rights/permits can no longer pump at their developed or “historically established” diversion rates, this may be considered an adverse impact.

CONCLUSIONS:

1. This application proposes to appropriate water from the Highmore Blunt aquifer at a maximum diversion rate of 3.31 cfs for the irrigation of 232 acres in Sully County.
2. There is a reasonable probability that unappropriated water is available from the Highmore Blunt aquifer for this proposed appropriation.
3. There is a reasonable probability that the diversion proposed by this application can be made without adversely impact existing appropriative or domestic users.



Adam Mathiowetz
SD DENR-Water Rights Program

Approved by:



Ken Buhler
SD DENR-Water Rights Program

REFERENCES:

- Circuit Court of South Dakota, First Judicial Circuit. 2012. May 17, 2012 Memorandum Decision re: Longview Farms, LLP v. South Dakota Dept. of Environ. and Nat'l. Resources.
- Circuit Court of South Dakota, First Judicial Circuit. 2012. April 12, 2012 Memorandum Decision re: Hanson County Dairy v. Robert Bender and Stace Nelson.
- Circuit Court of South Dakota, Sixth Judicial Circuit. 2005. April 29, 2005 Memorandum Decision re: HU04-37 Hines v. SD Department of Environment and Natural Resources.
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- Hamilton, L.J. 1986a. Major Aquifers in Hughes County, South Dakota. Information Pamphlet No. 29. SD DENR-Geological Survey. Vermillion, South Dakota.
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- Hedges, L.S., S.L. Burch, D.L. Iles, R.A. Barari, and R.A. Schoon. 1982. Evaluation of Ground-water Resources in Eastern South Dakota and Upper Big Sioux River, South Dakota and Iowa. Task 1: Bedrock Topography and Distribution, Task 2: Extent of Aquifers, Task 3: Ground-Water Storage, Task 4: Computerized Data Base, Final Report; U.S. Army Corps of Engineers Contract DACW 45-80-C-0185.
- Water Rights. 1980-2014. "1979-2013 Irrigation Summaries by Aquifer": SD DENR-Water Rights Program, Joe Foss Building, Pierre, South Dakota.
- Water Rights. 2015a. Observation Well Files. SD DENR-Water Rights Program, Joe Foss Bldg., Pierre, South Dakota.
- Water Rights. 2015b. Water Right/Permit Files. SD DENR-Water Rights Program, Joe Foss Bldg., Pierre, South Dakota.
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